# On the Nature of the Carcass of a Large Vertebrate Found off of New Zealand*

Yoshikazu HASEGAWA** and Teruya UYENO***

The carcass of a large vertebrate was discovered off the coast of New Zealand and brought on board the trawler, Zuiyo-maru (2,455 tons) for examination on April 25th, 1977. The body was measured and photographed by Michihiko Yano, and after the removal of some pieces of fiber from the pectoral fin, the carcass was thrown back into the sea.

Here we will attempt to discuss the nature of this animal from two viewpoints. First, Hasegawa will present evidence as to whether or not this animal belongs to the plesiosaurian reptiles. Second, Uyeno will discuss the possibility that this animal is a fish. Our considerations are based on three groups of evidence: 1) fibers from the pectoral fin which were brought back by Yano, 2) testimony on observations made by witnesses, i.e. Yano and the crew members of the Zuiyo-maru, and 3) five color photographs taken aboard the ship by Yano (four of them are shown in Pl. 1).

## Is this creature a plesiosaurian reptile?

If a single vertebra had been taken from the dead animal, it would be enough to solve this problem. However, with the evidence at hand, the decision must be made on the following series of deductions. First, the dead body of this creature had no skin left, but had muscles and almost a complete skeleton, with the exception of the jaws. In plesiosaurs, the bones of all the limbs exist at the ventral portion of the body. If this creature was a plesiosaurian reptile, the ventral parts of the body, including the limbs would have already been detached from the backbone.

In most vertebrate animals, the four limbs are designed to support and hold up their bodies, but in the case of plesiosaurs, the four limbs are hanging down from the backbone. If in fact it is a plesiosaur in a decomposed condition, the backbone and ribs would remain, while the limbs would have fallen off. In the process of vertebrate evolution towards terrestrial life, vertebrates gained four legs, in which the front limb structure consists of the scapula (1), the femur (1), ulna–radius (2), some palm bones, and phalangids (5). The hind limbs also consist basically of the same structure: pelvic bone (1), femur (1), fibulotibia (2), some palm bones, and phalangids (5). In reptiles adapted to marine life, as in plesiosaurs, ichthyosaurs and *Tylosaurus,* the bones are flattened and the number of phalangids are increased, but the basic structural pattern has not changed in some hundred

* Received March 20, 1978
** National Science Museum, Shinjuku-ku, Tokyo 160
*** Nippon Luther Shingaku Daigaku, Mitaka, Tokyo 181

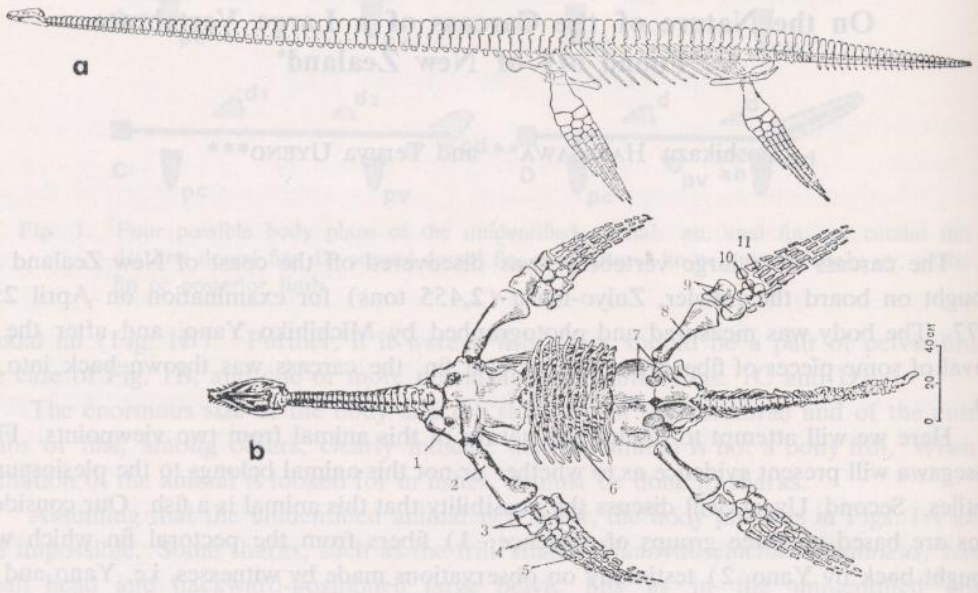


Fig. a A lateral view of the long-necked plesiosaur, *Hydrotherosaurus*. The scapula and pelvic bones are very simple. (From Welles)

Fig. b A ventral view of the short-necked plesiosaur, *Rhomaleosaurus*. The breast bone and pelvic bone are large and flat. Several sets of costa-like bones are present between these two bones. (From Fraas)
1, breast bone; 2, humerus; 3, ulna-radius; 4, palm bones; 5, phalangids; 6, costa-like bones; 7, pelvic bone; 8, femur; 9, tibio-fibula; 10, palm bones; 11, phalangids.

million years. From the Jurassic Period to the Cretaceous Period, some changes have taken place at the species level of plesiosaurs, but the skeletal structure has remained the same. According to Yano's sketch, the limb structure was depicted as having a scapula, a femur, and fibrous material. This structure does not agree with that of four-legged animals, nor is it reasonable to assume that it is due to evolutionary change.

If it were a plesiosaur, the body would not take on the bent posture as shown in the photograph, provided the front limbs remain, because the breast bone is large and flat (Fig. b). Also, some sets on costa-like bones on the ventral side, which are located in the abdomen of plesiosaurs are absent in this creature. According to Yano's observations, the head of this animal resembled that of a turtle but plesiosaurian reptiles have somewhat triangular skulls. At this degree of decomposition, some teeth should still be remaining on the upper jaw. If the degree of decomposition is advanced to the point that the front portion of the skull has fallen off, the shape of the body should be more distorted, if not destroyed. From the osteological point of view, we conclude that this creature does not belong to the plesiosaurian reptiles.

## Then can it be a fish?

Looking at the five photographs taken by Yano on board the ship, we did not find any features which contradict the assumption that the creature is in fact a fish. If it is, it was undoubtedly a shark, due to its great length, about 10 meters long. The five color photographs provided through the Tokyo University of Fisheries are clear, however, the absence of skin and decomposed connective tissue covering the skeleton and muscles makes judgement very difficult. From the photographs, the structure of the part of the articulation at which the pectoral fin is attached to the shoulder girdle resembles that of a shark. As far as we are aware, the fibrous material which appears to be ceratotricha, is found only in Chondrichthyes. Since the nature of the fibrous material, including electronmicrographs, are being reported on elsewhere, this matter will not be discussed here.

From testimony by Yano and the crew members of the Zuiyo-maru which appeared in articles in the Yomiuri newspaper and the Asahi newspaper, and through direct conversation with Yano, we have gathered a few more pieces of evidence which may support the shark theory. Yano's measurement of the ribs was 40 cm, which is too short for ribs of any vertebrates other than the cartilagenous ribs of sharks. Witnesses stated that the pectoral and pelvic fins were almost the same size. In sharks, the pelvic fin is much smaller than the pectoral fin. However, if the animal was a male, it must have had a large clasper, which is a continuation in the median axis of the pterygium of the pelvic fin. Therefore, in the male, the pelvic fin might appear as a large structure.

However, witnesses also stated that the carcass did not smell of ammonia, which is a characteristic feature of shark flesh. An explanation for this could be due to the extent of skin loss and decomposition, and therefore allowing the ammonia from the carcass to be washed out by the sea. The strongest argument opposing the shark theory comes from Yano's observation that the carcass was covered by a fat-like sticky substance. Sharks do not have a thick layer of fat under the skin. Yano also observed that the flesh (or meat) of the creature was reddish, as in the flesh of whales. Eiichi Fujii, a former student of mine and an ichthyologist on board the research vessel, Kaiyo-maru has informed us that even the muscle of squalid sharks appears as red as tuna meat along both sides of the backbone.

What may in fact be the decisive factor, can be observed in the photograph showing the dorsal aspect of the creature. The structure hanging down on the right side at the middle of the body appears to be the dorsal fin, and not the pectoral fin as some believe. The position is too high and close to the vertebral column to be the pectoral fin. If this observation is correct, then there is no doubt that this creature is a shark.

Based on the available evidence, we are convinced that this New Zealand creature is not the "New Nessie" that much of the world was hoping for, but more than likely a carcass belonging to a large size shark.

Se. B.

## Acknowledgements

The authors wish to express their appreciation to Mr. Michihiko Yano and Mr. Eiichi Fujii for contributing much valuable information.